Topic: N172-121

Q Peak, Inc.

Epoxyless Connectors for Optical Fiber

Q-Peak has developed fiber connectors which achieve low loss at record power levels. Q-Peak Inc. is a small business located in Bedford, MA with over 30 years' experience delivering laser components and systems, including pulsed and continuous wave sources spanning ultra-violet to infrared. Q-Peak will deliver mid-IR fiber connectors with improved power handling for military aerospace air vehicle fiber networks. Using materials developed at the Naval Research Laboratory, Q-Peak has created a proprietary process which prevents stray light from harming sensitive optical components. Having demonstrated that optical characteristics of the fiber are unharmed by its process, Q-Peak is conducting high power testing. Q-Peak is seeking commercial and government partners to invest in and integrate its connectors into high power fiber laser products.

Technology Category Alignment:

EO/IR Components for sensing, transmission and communication
Fixed Wing Vehicles (includes UAS)
Advanced Electronic Protection Techniques and Technology
Electro-Optical/Infrared (EO/IR)

Contact:
Eric Park
park@qpeak.com
(781) 271-1801
http://www.qpeak.com/
SYSCOM: NAVAIR
Contract: N68335-19-C-0053
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-19-C-0053

Department of the Navy SBIR/STTR Transition Program

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NAVAIR JSF19-1113

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WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-272

Transition Target: MilAero applications

TPOC:
(301)757-5396

Other transition opportunities: High bandwidth applications in all fixed wing and rotary combat aircraft, fiber lasers for use in free space optical communications, lidar, ladar, directed energy, laser materials processing, laser field tools, and all other high power fiber applications.

https://www.eglin.af.mil/News/Photos/igphoto/2000563023/mediaid/471

WHAT

Operational Need and Improvement: Infrared Countermeasures (IRCM) systems protect combat aircraft from IR-homing weapons such as man-portable air-defense systems (MANPADSs) by transmitting infrared radiation that blinds or otherwise confounds the munition's homing mechanism. Due to a lack of modularity existing fiber optic connectors have difficulty in increasing transmitted power from IRCM systems. Q-Peak has developed novel fiber connectors with improved power handling and low insertion loss.

Specifications Required: The connectors should be capable of transmitting Mid-IR (2-6µm) pulses with a peak intensity of 10 GW/cm2 through the fiber core and 100W average power. The connectors shall also be compliant with AS6021, MIL-PRF-29504B, MIL-PRF-64266B, and MIL-STD810G specifications.

Technology Developed: Using novel materials established at the Naval Research Laboratory (NRL), Q-Peak has developed expanded-beam fiber connectors using a proprietary assembly process which provides modularity and prevents stray light from harming sensitive optical components. Because these connectors are of the expanded beam type, they are significantly more tolerant of dust, oils and other environmental contaminants which would damage conventional types. Q-Peak's connectors use carefully considered materials and design analyses to ensure they are shock, vibration, temperature and humidity insensitive to ensure long Mean Time Between Failure intervals and high mission capable rates. Having demonstrated that the optical characteristics of the fiber are unharmed by its assembly process, Q-Peak is engaged in high power testing. Q-Peak seeks commercial and government partners to invest in and integrate its connectors into high power fiber laser products.

Warfighter Value: In addition to IRCM systems, these high power fiber connectors would be useful in LIDAR systems, Directed Energy (DE) systems, materials processing and in myriad other areas. High power fiber systems lack modularity as they must be connected via fusion splicing requiring skilled technicians, sensitive equipment, and a clean environment. This lack of modularity is a key impediment to the development and application of high power fiber lasers in all areas, as components cannot be effectively tested prior to integration and cannot be replaced in the field. As such, availability of high power fiber connectors will enhance warfighter capability by reducing costs, reducing time to initial operational capability, and increasing mission-ready rates for high power fiber systems.

WHEN

Contract Number: N68335-19-C-0053

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate optical suitability of soldering process	High	Light Propagation through soldered fiber	3	March 2018
Prototype ferrule high power test	Med	Power transmitted without damage	3	September 2019
Prototype connector epoxy bonded	Low	Power transmitted without damage	4	September 2019
Prototype cable asssembly tested after thermal, Shock, and Vib	Low	Low insertion loss, high power throughput	5	December 2019
Laser welded cable assembly high power test	Med	Power transmitted without damage	5	April 2020
Laser welded cable assembly tested after thermal, Shock, and Vib	Low	Low insertion loss, high power throughput	6	August 2020

HOW

Projected Business Model: Q-Peak is investing in laser welding and fiber polishing processes and equipment in order to enable Low Rate Initial Production (LRIP) of fiber optic cable assemblies using its novel expanded-beam connectors for military aerospace fiber optic networks beginning in 2020. As a research-oriented small business, Q-Peak will remain open to licensing opportunities in the event that demand for it's cable assemblies should increase more rapidly than anticipated.

Company Objectives: Q-Peak would like to explore additional transition opportunities related to high average power fiber products. In directed energy, Q-Peak hopes that it's fiber connectors will enable the integration of fiber amplifiers, isolators, and other high power components into coherently combined systems as Line Replaceable Units (LRUs), thus easing assembly, integration, testing, and servicing of such systems.

Potential Commercial Applications: Q-Peak proposes that it's fiber connector technology will help the materials processing industry move beyond the factory floor into field applications by providing modular tools using a common light source, as in a shipboard application where a centralized laser source could be distributed to various areas for use in cutting, welding, stripping, and other activities.

Contact: Eric Park, Vice President
park@qpeak.com 7812711801